Plant Document Analysis

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End of Engineering Analysis Report

Below is a focused extraction and short industry-reference summary specific to "Weld procedure" using only items explicitly stated in the supplied document and noting the industry-standard items that such a weld procedure must address.

Section 1: Accepted Specifications for Evaluation of Weld procedure

• **The document requires compliance with API 650 (and its Supplement) for tank design and construction; weld procedures must therefore be consistent with API 650 requirements where applicable. (Document:** multiple clauses referencing API 650; Purpose §1.1; Codes & Standards §7.)

• **Welding, heat treatment and non■destructive testing shall be in accordance with Project Specification. (Document:** Clause 9.5 “Welding, heat treatment and non-destructive testing shall be in accordance with Project Specification.”)

• **Vendor Data Requirement explicitly requires submission of the weld procedure. (Document:** Section 12.2, item xii “Weld procedure”.)

• **Vendor Data Requirement explicitly requires submission of the NDE procedure. (Document:** Section 12.2, item xiii “NDE procedure”.)

• **Mill test reports or certificates of compliance shall be furnished to the Construction Manager. (Document:** Clause 6.2.1.)

• **Where plates are used for flanges, plates greater than 20 mm shall be ultrasonically tested. (Document:** Clause 5.7.1.11.)

• **Gasket contact faces of plate flanges shall be machined only after flange-to-nozzle-neck welding has been completed. (Document:** Clause 5.7.1.11.)

• **When shell plates with openings require post-weld heat treatment (PWHT), openings shall be grouped in as few plates as possible. (Document:** Clause 5.7.4.1.)

• **For austenitic stainless steel tanks, design and testing specifics:** austenitic tanks shall be designed per Appendix S and have specific hydrotest chloride limit; hydrotest of austenitic stainless steel tanks shall be with water containing not more than 30 ppm chlorides. (Document: Appendix S note; Clause 7.3.5.5.)

• **Hydrotest for carbon steel materials requires potable quality water with chloride content less than 250 ppm. (Document:** Clause 7.3.5.5.)

• **Welding, PQR/WPS and welder qualifications are expected to be part of vendor submissions (implied by requirement to submit "Weld procedure" and that “Welding, heat treatment and NDT shall be in accordance with Project Specification”). (Document:** Sections 9.5 and 12.2.)

Section 2: Measurements Provided in Document (explicit numeric values related to welding/heat treatment/NDE in the document)

• **20 mm:** plates greater than 20 mm used for flanges shall be ultrasonically tested. (Clause 5.7.1.11)

• **12.5 mm:** shell thickness required for pressure plus corrosion allowance exceeding 12.5 mm shall be designed and constructed in accordance with API 620 (affects when different welding/qualification rules per API 620 apply). (Appendix F.7.1)

• **30 ppm:** maximum chloride content for hydrotest water for austenitic stainless steel tanks. (Clause 7.3.5.5)

• **250 ppm:** maximum chloride content for carbon steel material hydrotest water. (Clause 7.3.5.5)

• 0.25% maximum carbon, and carbon equivalent (C.E.) maximum 0.43 for carbon and carbon■manganese steels (affects weldability and preheat/PWHT decision). (Clause 4.1.8 and CE formula provided)

• **6 mm (0.25 inch):** minimum corrosion allowance for anchor components (may affect weld prep/fit-up for anchor attachments). (Clause 5.12.5)

• **Minimum PWHT grouping requirement:** openings to be grouped in as few plates as possible when PWHT is required (qualitative, but explicit requirement). (Clause 5.7.4.1)

• **M33:** minimum size of anchor bolt (relevant where welded anchor plates or welds to anchor assemblies are concerned). (Appendix B.9 and repeated)

Section 3: Inputs and Additional Requirements from Client (items the document requires vendors to provide, and information explicitly identified as needed but not specified)

Vendor-provided items (explicitly listed in the document)

• Weld procedure (Section 12.2, xii).

• NDE procedure (Section 12.2, xiii).

• Weld procedure qualification records (not separately listed, but submission of "Weld procedure" implies acceptance evidence; document explicitly requires “Welder Qualifications”

elsewhere via general vendor data? — the document does not explicitly list PQR/WPS/WPQ words beyond “Weld procedure”).

• Material test procedures / certificates (Section 12.2, xiv; Mill test reports per 6.2.1).

• Design calculations and structural & support calculations (Section 12.2, vi & vii) — relevant if welds are part of structural design.

• Inspection Test Plan (ITP) (Section 12.2, xi) — NDT/Welding hold points to be included.

• Manufacturing Record Book / As-built manufacturing and testing documents (Section 12.4 - ii).

Explicitly called out missing/clarification items that the document requires from the vendor or needs to complete a weld-procedure evaluation (document asks for these but does not specify the details):

• The Project Specification that defines the detailed welding, heat treatment and NDT requirements (the document defers welding/HT/NDT specifics to the Project Specification; that Project Specification is not included here). (Clause 9.5)

• Specific code(s) to be used for welding procedure qualification and welder qualification (ASME IX, AWS D1.1, ISO 15614, etc.) — the document does not state which of these is to be used; it only refers to “Project Specification” and API 650.

• Required WPS/PQR content and acceptance criteria (preheat, interpass temperature, PWHT temperature/time, heat input limits, filler metal specification, electrode/filler classification, hydrogen control, backing, joint geometry and root treatment) — these parameters are not specified in the provided document; vendor is required to submit the weld procedure but the document does not list the parameter values the buyer expects.

• Scope and acceptance criteria for NDE (types required—VT, PT, MT, UT, RT; acceptance levels; extent/percent coverage; hold points) — document requires NDE procedure submission but does not define scope/acceptance.

• Requirement and procedure for PWHT (temperatures, hold times, cooling rates, documentation) where PWHT is applicable — document states grouping rule for openings but does not provide PWHT parameters.

• Qualification/acceptance criteria for repair welding (limits, requalification requirements) — not provided.

• Specific consumable/filler metal specifications and traceability requirements (e.g., AWS/ISO/EN/ASTM designation expected) — not provided.

• Welding inspection hold points and witness points expected by the Construction Manager (document references HP/WP/RIs for inspection points in general §10.3 but does not give specifics for welding).

• Required records to be submitted after welding (e.g., WPS, PQR, WPQ, NDT reports, welder qualification records, heat treatment records, welding log) — vendor data list implies many of these but does not itemize exactly which welding records must be delivered and in what

format.

• Clarification whether ultrasonic testing for flange plates >20 mm is required for all flange plates or only when plates are used for flanges (the clause states “Wherever plates are used for flanges, the plates greater than 20 mm shall be ultrasonically tested” — vendor should confirm scope).

• Any special welding requirements for austenitic stainless steel tanks (e.g., chloride control, welding consumables, interpass temperature limits to avoid sensitization) beyond the hydrotest chloride limit—document defers details to Appendix S and Project Specification but does not give welding parameter details.

Relevant industry-standard references (for vendor to include/align weld procedure with) — listed here only as references the document expects the weld procedure to be consistent with; these are NOT additional requirements from the provided document but are typical standards used to define weld procedure content:

• API 650 (applicable clauses for welding on welded tanks)

• ASME Section IX (Qualification of Welding Procedures and Welders)

• AWS D1.1 / ISO 15614 (common standards for welding procedure qualification and execution where applicable)

• Project Specification (explicitly required by document to govern welding, heat treatment and NDT)

Summary /

Next actions required from you (concise)

• **Provide the Project Specification referenced in Clause 9.5 (or state the welding code you require:** e.g., ASME IX, AWS D1.1, ISO 15614) so the weld procedure can be prepared to the correct qualification and acceptance criteria.

• Confirm the expected contents of the “Weld procedure” submittal (WPS, PQR, WPQ records, welding logs, heat treatment records, NDE acceptance criteria and scope).

• Confirm required NDE types and extent (VT/PT/MT/UT/RT) and acceptance criteria for welds and machined flange faces.

• Confirm whether additional constraints apply for stainless steel (e.g., maximum test water chlorides are specified; confirm welding consumables, interpass limits, PWHT needs).

• Confirm whether ASME IX (or another standard) is to be used for qualification of WPS/PQR and welder performance qualification.

If you want, I can:

• Draft a compliant WPS/PQR/Welding submittal template that meets API 650 practice and aligns with ASME IX (or another code you select), using only those parameters you confirm; or

• Produce a checklist of all specific weld parameters and records you must supply to satisfy the vendor data requirements and Project Specification (so you can fill in values).